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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/772,525	02/05/2004	Walter Block	960296.00002.P03110	5403

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EXAMINER	
KHOLDEBARIN, IMAN K	

ART UNIT	PAPER NUMBER
3737	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

pat-dept@quarles.com

Office Action Summary	Application No.	Applicant(s)	
	10/772,525	BLOCK ET AL.	
	Examiner	Art Unit	
	I Kenneth Kholdebarin	3737	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *01/18/2005 and 05/26/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.
>
> *This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).*

2. Claim 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mistretta (US 6,381,486) in view of Mistretta (US 6,556,856).

Re Claim 1: Mistretta ('486) teaches a method for the use of magnetic resonance angiogram which is acquired using a contrast enhancement method of a series of low resolution NMR images during a time resolved phase of the examination in which the contrast bolus makes a first pass through the arteries and veins. High resolution NMR image data is acquired in a subsequent steady state phase of the examination from which a high resolution NMR image is reconstructed. Mistretta further comprises to combing a peripheral portion of the NMR K-space

data acquired with the corresponding series of filtered K-space center data sets to form a series of filtered k-space data and further reconstructing an images by transforming a filtered K-space dats set. (See Fig. 7 and 8) Mistretta fails to disclose or fairly suggest the method, where to use the mask on voxel vectors formed from data in corresponding voxels and producing a series of low resolution vascular images by multiplying the low resolution time course images by the mask.

Mistretta ('856) teaches in order to distinguished the arteries from the vein and the background tissue the Mask on the voxel will apply while comparing the signal at each voxel during the time resolved phase of the acquisition with arterial and venous contrast enhancement reference curves (Col. 7, line 58-63).

Therefore, in view of Mistretta ('856), it would have been obvious to one of ordinary skill in the art at the time the invention was made to multiply the mask and the low-resolution time course, in order to distinguished the arteries from the vein and the background tissue in the steady state phase.

Re Claim 2: Mistretta ('486) disclosed that reconstruction of the image takes place (step 336) by transforming (3D Fourier transformation) the corresponding series of the filtered K-space data set. (Col. 12, line 40-44).

3. Claim3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mistretta (US 6,381,486) in view of Mills (US 2004/0027127).

Re Claim 3 and 4: Although Mistretta fails to suggest to disclose time course voxel vector is produced with a method that producing a matrix having values which model the characteristic behavior of NMR but Mill teaches that RF NMR values [characteristic] is an element of a matrix. The matrix of Fourier components that correspond to the NMR signal of a given voxel over the detectors are determined for all of the voxels. The measurement of the spatial variations of the transverse RF field of a given matrix is used to determine the coordinate location of each voxel, (See paragraph 42). Mills further discloses that the inversion reconstruction algorithm of the Matrix will be used to determine the coordinate location of each voxel (presented in the current application as orthogonal complement of the matrix) (See Paragraph 0168). Therefore, in view of Mills, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the Matrix with characteristic of NMR, in order locate coordinate and characteristic of each voxel while each matrix of components associated by phase comprises the intensity variation over the sample space of the NMR field.

Re Claim 5 and 6: Mistretta ('486) disclosed that for ambiguous voxels which cannot be characterized by the connectivity method, a signal analysis method may be employed to further refine the segmentation [calculating the natural logarithm of the orthognality image values]. Mistretta further discloses, a region of voxels (e.g. 10 by 10 voxels) surrounding the ambiguous voxel is selected and a histogram of the signal levels in the time-resolved image having peak arterial contrast enhancement is produced, the histogram indicates the number of voxels at each possible signal level, and a peak will occur when many voxels of substantially the same signal level are present in the region. A voxel number threshold is set at 20% of the peak number of

voxels as indicated by dashed line 286. If the signal amplitude of the ambiguous voxel lies within the greater than 20% range of this peak as indicated at 288, it is characterized as a vessel (See Col. 10, line 13-26 and Fig. 6).

Re Claim 7-9: Mistretta ('856) discloses applying the mask and producing the low resolution background images and further combining the low-resolution background images with the corresponding low resolution of vascular images. Mistretta states in order to achieve one single image it is required to combine all the images of NMR data acquired during the different phase of the scan, (col. 9, line 61-65).

Mistretta emphasized although his teaching could be used with a number of different pulse sequences, the preferred embodiment of the invention employs a 3D gradient recalled echo pulse sequence depicted in Fig. 2 of Mistretta's invention, (Col. 5, line 31-35).

Mistretta shows in Fig. 7 that combining K-space data of several images taken in different steps (e.g. step 330 for Vessel and 316 for Arterial) is known to ordinary skill in the art at step 344.

4. Claim 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mistretta (US 6,381,486) in view of (US 6,556,856) further in view of Biswal (US 2002/00852495).

Re Claim 10 –11: Mistretta teaches a method for the use of magnetic resonance angiogram which is acquired using a contrast enhancement method of a series of low resolution NMR images during a time resolved phase of the examination in which the contrast bolus makes

a first pass through the arteries and veins. High resolution NMR image data is acquired in a subsequent steady state phase of the examination from which a high resolution NMR image is reconstructed. Mistretta further comprises to combing a peripheral portion of the NMR K-space data acquired with the corresponding series of filtered K-space center data sets to form a series of filtered k-space data and further reconstructing an images by transforming a filtered K-space dats set. (See Fig. 7 and 8) Mistretta fails to disclose or fairly suggest the method, where to use the mask on voxel vectors formed from data in corresponding voxels and producing a series of low resolution vascular images by multiplying the low resolution time course images by the mask.

Mistretta ('856) teaches in order to distinguished the arteries from the vein and the background tissue the Mask on the voxel will apply while comparing the signal at each voxel during the time resolved phase of the acquisition with arterial and venous contrast enhancement reference curves (Col. 7, line 58-63). And further teaches on Fig, 4 that voxel vector which is indicative of NMR signals can be taken in a time interval A1 through A8. (See Fig. 4)

Biswal teaches producing time course voxel vector during NMR imaging, (Fig. 3A); Biswal shows the use of table (matrix) and performing of a process (inversing the values of the matrix) in producing the voxel vectors taken over the time domain (Paragraph [0045]).

Therefore in view Mistretta '856 and further in view of Biswal it would have been obvious to one ordinary skilled in the art at the time of the invention was made to produce a time course voxel vector and suppress the signals in voxel that do not differ from the model time in order to indicates the magnitude of the NMR signal at a voxel in the image slice over the time course study. It may be used to produce a graphic display as shown in FIG. 3B. The resulting time domain voxel graph 303 reveals very clearly variations in the activity of the brain in the

region of the voxel. Regions, which are responsive to a sensory stimulus, for example, can be located by identifying time domain voxel graphs that vary at the same repetition rate as the applied stimulus.

5. Claim 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mistretta (US 6,381,486) in view of Biswal (US 2002/00852495).

Re Claim 12 and 14: Biswal teaches a reference voxel vector such as that shown in FIG. 5 of Biswal's teaching is manually synthesized to represent the ideal response of the brain to the selected stimulation or function pattern. Fig. 5 shows the time interval(s) that the NMR signals ramp up in value during the performance of acquiring NMR K-space data for a series of BMR time course imaging as well as time interval(s) wit the a constant value. Fig 5. Furthermore Biswal shows on fig. 5 that NMR signals that ramp up in value after constant value duration ends in each time interval.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Mistretta discloses Magnetic resonance angiography using undersampled 3D projection imaging; Stromberg discloses Dual resolution acquisition of magnetic resonance

angiography data with vessel segmentation; Jesmanowicz discloses Perfusion magnetic resonance imaging using encoded RF tagging pulses.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to I Kenneth Kholdebarin whose telephone number is 571-270-1347. The examiner can normally be reached on M-F 8 AM- 4 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian Casler can be reached on 571-272-4956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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04/28/2007

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